FOSTER WHEELER ENVIRONMENTAL CORPORATION

November 22, 1999
1284-0019-99-0582
No Response Required

Mr. Robert Krivinskas
ROICC, Code R3
Northern Division
Naval Facilities Engineering Command
Narragansett Bay Area
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Newport, RI 02841-1711

Subject: NORTHDIV RAC NO. N62472-94-D-0398
DELIVERY ORDER NO. 0019 – NAVSTA, NEWPORT, RHODE ISLAND
RESPONSE TO COMMENTS OF ENVIRONMENTAL PROTECTION AGENCY
DATED MARCH 23, 1999

Dear Mr. Krivinskas:

On March 23, 1999 the Environmental Protection Agency (EPA) submitted comments on the Air Modeling report for the above referenced site. Attached are responses to the EPA March 23, 1999 comments.

If you require any additional information, please call me at 617-457-8200.

Sincerely,

John J. Balco, PG
Delivery Order Manager

Enclosure

cc: P. Kulpa, RIDEM
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FOSTER WHEELER ENVIRONMENTAL CORPORATION
U.S. NAVY NORTHERN DIVISION REMEDIAL ACTION CONTRACT (RAC)
CONTRACT NO. N62472-94-D-0398
NAVAL STATION NEWPORT (NAVSTA) NEWPORT, RHODE ISLAND
SITE 01 - McALLISTER POINT LANDFILL

RESPONSES TO EPA COMMENTS
FINAL LANDFILL VENT EMISSION SCREEN3 MODELING ANALYSIS

The following are responses to EPA review comments on the Final Landfill Vent Emission SCREEN3 Modeling Analysis, dated February 1999. EPA comments are provided in italic type followed by Foster Wheeler's responses in bold type.

Reviewer: K. Keckler (EPA) Date: March 23, 1999

Comment 1: *Page 4, Section 2.0 - The recommended air quality models are listed in Appendix A of 40 CFR 51, Appendix W. SCREEN3 is not listed among the EPA preferred air quality models. Appendix W, 5.2.1 states that screening techniques are an acceptable approach to air quality analyses and suggests the use of TSCREEN, with certain qualifiers. The SCREEN3 user's manual expressly states in section 1.5 that the model cannot determine maximum impacts from multiple stacks, except by merging sources in accordance with a reference. The correctly referenced section has little information, other than data inputs required for a single emission source.*

Appendix W, section 7.2.8 discusses the air pathway analyses of air toxics and hazardous waste. This section focuses upon modeling procedures of neutrally buoyant toxic and hazardous pollutant releases. The model SCREEN3 is not discussed and model TSCREEN is the suggested screening model. The ISC model forms are the basis of the regulatory enforcement program. If the Navy chooses to continue with SCREEN 3 as the air model, then EPA believes that further explanation is warranted as to why the models suggested in Appendix W, section 7.2.8 were not chosen. EPA reserves the right to refute modeling results from non-approved models.

The Navy has stated that the most conservative technique used in this modeling was the combination of all the vents into one emission source. Although EPA agrees in principal to this assumption, we remain skeptical about the model results pending further details on the actual procedures and numbers that were used. This information has not been provided clearly, and the logic and mathematics are not straightforward. Does the word "combined" refer to an arithmetic total, a weighted average, or something else? How was this "combined" value specifically used in the SCREEN3 modeling?

Response: **SCREEN3 is identified in 40 CFR 51 Appendix W section 4.2.1 "Screening Techniques". The specific reference cited is Environmental Protection Agency 1995. SCREEN 3 User's Guide. EPA publication No. EPA-454/B-95-0004. U.S. Environmental Protection Agency, Research Triangle Park, NC (NTIS No. PB95-222766).**

We do agree as suggested in the comments provided that the TSCREEN modeling system could be used, but given the type of sources being considered (Vents) in this

analysis the SCREEN system would also select the SCREEN3 model to perform the analysis. The only difference between the SCREEN3 model used by TSCREEN and SCREEN3 model used in the analysis submitted is that TSCREEN uses version 95250 of SCREEN and the version of SCREEN3 used in the analysis submitted is newer (version 96043). As it is generally preferred that the most recent version of a model be used, version 96043 was used for this analysis.

As a point of information, the difference between the two versions is the addition of 3 non-regulatory options to version 96043 (see attached EPA model change bulletin SCREEN3). These options were not used in the analysis submitted; therefore, the use of TSCREEN or SCREEN3 will produce the same results.

To demonstrate that TSCREEN produces the same results as SCREEN3 (96043), the output from the TSCREEN is attached (Attachment A). A comparison of the attached output and that provided with the original analysis show that the results are identical.

In reference to combining the emissions from all the point sources into one source, this was accomplished by arithmetically adding up emission rates from all the vents and assuming the arithmetic total was emitted at one location. This approach is consistent with the philosophy of screening and produces higher impacts than if the emissions were with the actual spatial separation of the vents.

Comment 2: *Table 5-1 - Should be corrected. The value listed in the table for bromomethane is 5.7E-02 µg/m3. The value listed in the table for trans-1,3-dichloropropene is missing the exponent. The table should be corrected to present the RBC as 4.8E-02 µg/m3. The value listed in the table for hexanone is 1.5E+02 µg/m3. The actual RBC value is 5.1E+00 µg/m3. The value listed in the table for acrylonitrile is 5.10E+01 µg/m3. The actual RBC value is 2.6E-02 µg/m3.*

Response: **Table 5-1 has been modified to reflect this comment.**

Comment 3: *Page 9, Section 6.0 - The four hour vent gas TO-14 samples were converted to eight hour ppm concentration values. Please explain how these values were obtained, particularly since they were the base of the comparison in Table 6-1.*

Response: **The 4-hour vent gas TO 14 analyses are provided in parts per million per volume of gas collected (ppmv). Therefore, to convert the results to 8-hour concentrations, the 4-hour analytical results were multiplied by two.**

Table 5-1
Summary of SCREEN3 Modeling

Compound Name	Total Emission Rate (g/s)	Annual Modeled Impact (µg/m3)	Risk Based Conc EPA Reg III (µg/m3)	RIDEM Air Toxics Reg #22 (µg/m3)	Pass	Fail	N/A
Freon 12	4.06E-08	1.03E-03	1.80E+02	—	X		
Freon 114	1.09E-08	1.37E-04	N/A	—			X
Chloromethane	1.12E-10	2.00E-06	9.90E-01	—	X		
Vinyl Chloride	4.22E-10	7.53E-06	2.10E-02	—	X		
Bromomethane	3.12E-10	5.57E-06	5.1E0	—	X		
Chloroethane	1.04E-09	1.85E-05	2.20E+00	—	X		
Freon 11	5.12E-10	9.13E-06	7.30E+02	—	X		
1,1-Dichloroethene	2.15E-10	3.83E-06	3.60E-02	—	X		
Freon 113	4.15E-10	7.41E-06	3.10E+04	—	X		
Methylene Chloride	3.30E-10	5.89E-06	3.80E+00	2 E+00	X		
1,1-Dichloroethane	2.27E-10	4.06E-06	5.20E+02	—	X		
cis-1,2-Dichloroethene	4.15E-10	7.41E-06	3.70E+01	—	X		
Chloroform	2.65E-10	4.72E-06	7.80E-02	4 E-02	X		
1,1,1-Trichloroethane	2.97E-10	5.30E-06	1.00E+03	—	X		
Carbon Tetrachloride	3.41E-10	6.09E-06	1.20E-01	—	X		
Benzene	8.25E-10	1.47E-05	2.20E-01	1 E-01	X		
1,2-Dichloroethane	2.19E-10	3.91E-06	6.90E-02	4 E-02	X		
Trichloroethene	3.69E-10	6.59E-06	1.00E+00	3 E-01	X		
1,2-Dichloropropane	2.50E-10	4.47E-06	9.20E-02	—	X		
cis-1,3-Dichloropropene	2.46E-10	4.39E-06	4.80E-02	—	X		
Toluene	1.46E-09	2.61E-05	4.20E+02	4 E+02	X		
trans-1,3-Dichloropropene	2.46E-10	4.39E-06	4.80E-02	—	X		
1,1,2-Trichloroethane	2.96E-10	5.28E-06	1.10E-01	7 E+00	X		
Tetrachloroethene	4.25E-10	7.59E-06	3.10E+00	5 E-02	X		
Ethylene Dibromide	4.16E-10	7.43E-06	8.20E-03	—	X		
Chlorobenzene	8.45E-10	1.51E-05	1.80E+01	—	X		
Ethyl Benzene	4.35E-10	7.77E-06	1.10E+03	—	X		
m,p-Xylene	5.91E-10	1.05E-05	7.30E+03	7 E+02	X		
o-Xylene	3.75E-10	6.70E-06	7.30E+03	7 E+02	X		
Styrene	2.44E-10	4.36E-06	1.00E+03	3 E+01	X		
1,1,2,2-Tetrachloroethane	3.72E-10	6.64E-06	3.10E-02	—	X		
1,3,5-Trimethylbenzene	4.10E-10	7.31E-06	6.20E+00	—	X		
1,2,4-Trimethylbenzene	4.68E-10	8.35E-06	6.20E+00	—	X		
1,3-Dichlorobenzene	3.26E-10	5.82E-06	7.30E+00	—	X		
1,4-Dichlorobenzene	9.86E-10	1.76E-05	2.80E-01	—	X		
Chlorotoluene	2.81E-10	5.01E-06	7.30E+01	—	X		
1,2-Dichlorobenzene	3.26E-10	5.82E-06	3.30E+01	—	X		
1,2,4-Trichlorobenzene	4.02E-10	7.18E-06	2.10E+02	—	X		
Hexachlorobutadiene	5.78E-10	1.03E-05	8.00E-02	—	X		

Table 5-1 (cont'd)
Summary of SCREEN3 Modeling

Compound Name	Total Emission Rate (g/s)	Annual Modeled Impact ($\mu g/m^3$)	Risk Based Conc. EPA Reg III	RIDEM Air Toxics Reg #22	Pass	Fail	N/A
Propylene	4.68E-10	8.36E-06	N/A	—			X
Acetone	2.44E-08	4.36E-04	3.70E+02	—	X		
Carbon Disulfide	8.62E-10	1.54E-05	7.30E+02	—	X		
2-Propanol	1.38E-09	2.47E-05	N/A	—			X
trans-1,2-Dichloroethene	1.08E-09	1.93E-05	7.30E+01	—	X		
Vinyl Acetate	9.58E-10	1.71E-05	2.10E+02	—	X		
2-Butanone (Methyl Ethyl Ketone)	7.89E-09	1.41E-04	1.00E+03	—	X		
Hexane	2.97E-09	5.30E-05	2.20E+02	—	X		
Tetrahydrofuran	1.26E-08	2.25E-04	N/A	—			X
Cyclohexane	4.50E-09	8.04E-05	N/A	—			X
1,4-Dioxane	9.81E-10	1.75E-05	5.70E-01	—	X		
Bromodichloromethane	1.82E-09	3.26E-05	1.00E-01	—	X		
4-Methyl-2-pentanone	1.11E-09	1.99E-05	7.30E+01	—	X		
2-Hexanone	1.11E-09	1.99E-05	5.1E0	—	X		
Dibromochloromethane	2.32E-09	4.14E-05	7.50E-02	—	X		
Bromoform	2.81E-09	5.02E-05	1.60E+00	—	X		
4-Ethyltoluene	1.51E-09	2.69E-05	N/A	—			X
Ethanol	6.89E-10	1.23E-05	N/A	—			X
Methyl tert-Butyl Ether	9.81E-10	1.75E-05	3.10E+03	—	X		
Heptane	1.81E-09	3.24E-05	N/A	—			X
Cumene	1.35E-09	2.40E-05	4.00E+02	—	X		
Acrylonitrile	5.84E-10	1.04E-05	2.6E-2	1 E-02	X		

— = No RIDEM value available
N/A = No EPA value available

(Attachment A)

MODEL CHANGE BULLETINS

Model Change Bulletin

MCB#2 February 12, 1996

SCREEN3 (dated 96043)

This Model Change Bulletin documents changes made to the SCREEN3 model and to the user's guide that was available from SCRAM BBS.

Three new non-regulatory optional features have been added to this model. The first feature is the inclusion of an alternative mixing height algorithm based on a paper by R. Brode given at the 1991 Seventh Joint Conference on Applications of Air Pollution Meteorology with AWMA. The alternative mixing height is determined by using the maximum of a predetermined mixing height or a value adjusted slightly higher than the plume height, whichever is greater. Both the mixing height and adjustment values to the plume height are based on stability class. Selection of this algorithm results in concentrations that are generally more conservative than output from the ISCST3 model.

The second feature allows the optional input of an anemometer height in place of the default height which is set to 10 meters. This affects the stack top wind speeds for Choice of Meteorology selections 1 and 2. The stack top wind speed for Choice of Meteorology selection 3 is unaffected.

The third feature is the inclusion of an alternative cavity algorithm based on a paper by Lloyd L. Schulman and Joseph S. Scire published in the August 1993 issue of Air and Waste, The Journal of the Air and Waste Management Association. The published concentration results using this algorithm appear to be favorable with respect to sampled wind tunnel test concentrations.

Each of the non-regulatory options can be activated by adding the appropriate flag or value to the source type line of the input file. Details for using these options have been added to the SCREEN3 Model User's Guide and to the README file. The process for obtaining regulatory results can be found in the SCREEN3 Model User's Guide.

As a result, changes were made to MAIN.INC and to the SCREEN3 source code. MAIN.INC is an 'INCLUDE' file and contains many of the COMMON and DIMENSION statements used by SCREEN3. The following is a list of the individual changes which have been incorporated into MAIN.INC. The variable for the anemometer height, HANE, and the flag, ICI, indicating that the R. Brode Option 2 is to be used, were added to the Labelled Common statement, METVAR along with two arrays for holding constant values used in the Brode 2 mixing height algorithm. The line was changed from:

```
      COMMON /METVAR/ AFV, UREF, TA, KST, ZI, S, RTOFS, ZREF
```

to:

```
      COMMON /METVAR/ AFV, UREF, TA, KST, ZI, S, RTOFS, ZREF, HANE, ICI,
     &                ZIMIN(4), ZIFACT(4),
```

The following is a list of the individual changes which have been incorporated into SCREEN3 (dated 96043) from the SCREEN3A.FOR and SCREEN3B.FOR source codes. The FUNCTION ERF was edited out of SCREEN3A.FOR and was edited, by itself, into SCREEN3C.FOR. The sequence identification codes were shortened by deleting one of the zeros in each of the codes so the codes would not wrap around to the next line.

1. A SCRAM header was added to the begining of the source code as follows:

```
C*************************************************************************SCR0005
C                                                                         SCR0006
C                          SCREEN3 (DATED 96043)                          SCR0010
C                                                                         SCR0011
C            *** SEE SCREEN MODEL CHANGE BULLETIN MCB#2 ***               SCR0012
C                                                                         SCR0013
C     ON THE SUPPORT CENTER FOR REGULATORY AIR MODELS BULLETIN BOARD       SCR0014
C                                                                         SCR0015
```

```
C                              919-541-5742                              SCR0016
C                                                                        SCR0017
C************************************************************************SCR0018
C
C
C                        ***************************
C                        ***       SCREEN3       ***
C                        ***   (DATED  96043)    ***
C                        ***************************
C
C
C       MODIFIED FROM:
```

2. A modification summary was also added before the previous summaries of modifications. It contains the following text:

```
C                             MODIFICATION HISTORY
C
C       MODIFIED BY:
C
C             PETER ECKHOFF
C             EPA
C             MD-14
C             RESEARCH TRIANGLE PARK, NC 27711
C
C       MODIFICATION DATE:
C
C             FEBRUARY 12, 1996
C
C       MODIFICATIONS INCLUDE:
C
C             THE NEW ANEMOMETER HEIGHT ROUTINE WAS MOVED TOWARD THE
C             BEGINNING OF THE CODE.  THE ROUTINE WAS PREVIOUSLY PLACED
C             AFTER THE COMPLEX TERRAIN ALGORITHM WHICH NEEDS AN ANEMOMETER
C             HEIGHT.  THE INPUT SEQUENCE WAS ALSO ALTERED TO ACCOMODATE THE
C             NEW ALGORITHM ROUTINE.  SEVERAL OUTPUT STATEMENTS WERE ADDED
C             OR ENHANCED TO REFLECT THE USE OF THE NEW OPTIONS.
C
C             THE ADDITION OF THREE NON-REGULATORY OPTIONS:
C               1. AN ANEMOMETER HEIGHT OTHER THAN 10 METERS CAN NOW BE
C                  ENTERED AS AN OPTION, AND
C               2. THE ABILITY TO PRODUCE RESULTS THAT ARE CONSERVATIVE
C                  WITH RESPECT TO ISCST3 RESULTS.  OPTION 2, FROM THE
C                  R. BRODE PAPER GIVEN AT THE 1991 SEVENTH JOINT CONFERENCE
C                  ON APPLICATIONS OF AIR POLLUTION METEOROLOGY WITH AWMA,
C                  WAS ADDED AS AN OPTION.  THIS OPTION MINIMIZES THE MIXING
C                  HEIGHTS FOR UNSTABLE CASES THUS CREATING RESULTS THAT ARE
C                  MORE CONSERVATIVE WITH RESPECT TO ISCST2 RESULTS.
C               3. THE ADDITION OF THE SCHULMAN-SCIRE (1993) CAVITY
C                  FORMULATION FROM AN ARTICLE IN THE AUGUST 1993 OF AIR AND
C                  WASTE (JOURNAL OF THE AIR AND WASTE MANAGEMENT
C                  ASSOCIATION).
C
C             ALSO PROGRAMMED INTO THIS SOURCE CODE IS THE ABILITY TO USE
C                  PREVIOUS DATA SETS WITHOUT HAVING TO RE-EDIT THE DATA
C                  FOR CASES WHERE THE OPTIONS ARE NOT EXERCISED.
C
C************************************************************************
```

3. A short definition of the CAVITY2 subroutine was added after the definiton of CAVITY. The code was changed from:

```
C           CAVITY RETURNS MAX CONC, CAVITY HT, AND LENGTH OF
C                  CAVITY IF PLUME IS FOUND TO BE ENTRAPPED IN
C                  THE CAVITY RECIRCULATION REGION
```

to:

```
C           CAVITY RETURNS MAX CONC, CAVITY HT, AND LENGTH OF
C                  CAVITY IF PLUME IS FOUND TO BE ENTRAPPED IN
```

```
C                THE CAVITY RECIRCULATION REGION
C2         CAVITY2 RETURNS MAX CONC, AND LENGTH OF CAVITY IF
C2                 SCHULMAN-SCIRE FORMULATION IS SELECTED FOR
C2                 THE CAVITY REGION (POINT & FLARE SOURCES)
```

4. Several new variables were typed for the new input options. The code was changed from to include these new variables:

```
      INCLUDE 'MAIN.INC'
      INTEGER*2 IPTHR, IPTMIN, IPTSEC, IPTHUN, IPTYR, IPTMON, IPTDAY
C
```

to:

```
      INCLUDE 'MAIN.INC'
      CHARACTER*1 QZI
      CHARACTER*2 QSS
      CHARACTER*50 CINP
      INTEGER*2 IPTHR, IPTMIN, IPTSEC, IPTHUN, IPTYR, IPTMON, IPTDAY
      character*27 cavdef1,cavdef2
      logical lwind, lroof
C
```

and from:

```
      OUTFIL = 'SCREEN.OUT'
      SYINIT = 0.
```

to:

```
      OUTFIL = 'SCREEN.OUT'
      SOURCE = '     '
      SYINIT = 0.
```

5. The following comments and code were added to illustrate and initialize part of the new Cavity option. The code was changed from:

```
      CAVCHI(1) = 0.0
      CAVCHI(2) = 0.0
```

to:

```
      CAVCHI(1) = 0.0
      CAVCHI(2) = 0.0
      do i=1,4
         CAVCHI(i) = 0.0
         XR(i) = 0.0
      enddo
C2
C2c --- New input variables for CAVITY2: stack location on roof
C2c
C2c                                HW
C2c
C2c                  +--------------.---------------+
C2c                  |              .               |
C2c   (x/HW = .4)--> |  S           .               |
C2c                  |              .               |      HL
C2c                  |              .               |
C2c                  +--------------.---------------+
C2c                 .5              0               .5
C2c
C2c
C2c                                HL
C2c
C2c                           +------.------+
C2c                           |      .      |
C2c         (x/HL = .15)---> |      . S    |
C2c                           |      .      |
C2c                           |      .      |
C2c                           |      .      |        HW
C2c                           |      .      |
C2c                           |      .      |
C2c                           |      .      |
C2c                           |      .      |
C2c                           +------.------+
C2c                          .5      0     .5
C2c
C2c     xstkl  : position of stack x/HL from CENTER of building
C2c     xstkw  : position of stack x/HW from CENTER of building
        xstkl = 0.0
        xstkw = 0.0
        lroof = .TRUE.
C
```

6. The FORMAT statements in the input section were moved next to their respective WRITE statements where they were first viewed. The following code was changed from:

```
      WRITE(IDAT,79) TITLE
      IF (TITLE(75:79) .EQ. 'DEBUG') THEN
```

to:

```
      WRITE(IDAT,79) TITLE
79     FORMAT(A79)
      IF (TITLE(75:79) .EQ. 'DEBUG') THEN
```

and from:

```
        READ(IRD,100) QUERY
        IF (QUERY .EQ. 'Y' .OR. QUERY .EQ. 'y') THEN
```

to:

```
        READ(IRD,100) QUERY
100       FORMAT(A1)
        IF (QUERY .EQ. 'Y' .OR. QUERY .EQ. 'y') THEN
```

7. The interactive explanation on how to invoke the three new options were added by changing the following statement from:

```
CRWB     &       '                        VDEP FOR VOLUME - WITH DEPOSITION')
      READ(IRD,400) OPTG
      CALL LWRUPR
      SOURCE = OPTG(1:4)
79    FORMAT(A79)
400   FORMAT(A80)
100   FORMAT(A1)
40    FORMAT(A4)
      IF (SOURCE .EQ. 'P   ') THEN
```

to:

```
CRWB     &       '                        VDEP FOR VOLUME - WITH DEPOSITION')
      WRITE(IPRT,*) '   ALSO ENTER ANY OF THE FOLLOWING OPTIONS ',
     +              'ON THE SAME LINE:'
      WRITE(IPRT,*) ' '
      WRITE(IPRT,*) '     N     - TO USE THE NON-REGULATORY BUT ',
     +              'CONSERVATIVE BRODE 2'
      WRITE(IPRT,*) '             MIXING HEIGHT OPTION,'
      WRITE(IPRT,*) '     nn.n - TO USE AN ANEMOMETER HEIGHT OTHER ',
     +              'THAN THE REGULATORY'
      WRITE(IPRT,*) '             (DEFAULT) 10 METER HEIGHT.'
      WRITE(IPRT,*) '     SS    - TO USE A NON-REGULATORY ',
     +              'CAVITY CALCULATION ALTERNATIVE'
      WRITE(IPRT,*) '  Example - PN 7.0 SS (entry for a point source)'
      WRITE(IPRT,*) ' '
      WRITE(IPRT,*) ' ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:'

C     READ INPUT LINE AS A SOLID BLOCK OF CHARACTERS, THEN PARSE INTO
C      SEPARATE VALUES

      READ(IRD,400) CINP
400     FORMAT(A50)
        ILEN = LEN_TRIM(CINP)
       CALL LWRUPR(CINP, ILEN)
        IFLG = 0
        ICI = 0
        ISS = 0

C     PARSE AND PROCESS FIRST LINE OF INPUT DATA
C      DATA CAN CONSIST OF SOURCE TYPE, AND NON-REGULATORY MIXING HEIGHT,
C      ANEMOMETER HEIGHT, AND/OR BUILDING DOWNWASH OPTIONS.
C      NO OPTIONS ENTERED EQUATES TO REGULATORY DEFAULT.

C          DETERMINE THE SOURCE TYPE

         SOURCE(1:1) = CINP(1:1)
         IF (CINP(2:4) .EQ. 'DEP' .OR. CINP(2:4) .EQ. 'dep') THEN
           SOURCE = CINP(1:4)
         END IF
```

```
C         DETERMINE MIXING HEIGHT OPTION (BRODE 2 YES/NO)
C          DETECT AN 'N' UNDER THE OLD SCREEN2 OPTIONAL FORMAT

        DO I = 1, ILEN
           IF (CINP(I:I) .EQ. 'N' .OR. CINP(I:I) .EQ. 'n') THEN
             QZI = CINP(I:I)
             ICI = 1
           END IF
        END DO

C        BASED ON POSITION OF DECIMAL POINT, CONVERT ASCII INTEGER VALUES TO
C         AN ANEMOMETER HEIGHT VALUE.

          HANE = 0.0
          IDOT = ILEN + 1
          DO K = 1, ILEN
            IF (CINP(K:K) .EQ. '.') THEN
              IDOT = K
            END IF
          END DO
          DO K = 1, ILEN
            ICN = ICHAR(CINP(K:K)) - 48
            IF (ICN .GE. 0 .AND. ICN .LE. 9) THEN
              IDOTK = IDOT - K
              IF (IDOTK .GT. 0) IDOTK = IDOTK - 1
              HANE = HANE + ICN * 10. ** (IDOTK)
            END IF
          END DO

        ZREF = 10.0
        IF (HANE .GT. 0.0001) THEN
          ZREF = HANE
         ELSE
          HANE = 10.0
        END IF

C     SEARCH FOR A SCHULMAN-SCIRE ALTERNATIVE BUILDING DOWNWASH ALTERNATIVE
C      ALGORITHM FLAG (SS)

         DO I = 1, ILEN-1
            IF (CINP(I:I+1) .EQ. 'SS'.OR. CINP(I:I+1) .EQ. 'ss') THEN
              QSS = 'SS'
              ISS = 1
            END IF
         END DO

      WRITE(IDAT,101) SOURCE, QZI, HANE, QSS
101     FORMAT(A4,1X,A1,1X,F8.1,1X,A2)

      IF (SOURCE .EQ. 'P   ') THEN
```

8. End of input section comments were added; changing the code from:

```
C
C        SEE IF USER WANTS TO STOP AFTER COMPLEX TERRAIN CALCS-STP=.TRUE.
```

to:

```
C
C    END OF SOURCE, MIXING HEIGHT OPTION, AND OPTIONAL ANEMOMETER HEIGHT
C      INPUT ALGORITHM

C
C        SEE IF USER WANTS TO STOP AFTER COMPLEX TERRAIN CALCS-STP=.TRUE.
```

9. The CALL to the new cavity algortihm was added to the area of code where the old CALL to the regulatory cavity algortihm is located. The two CALL statements were integrated by changing the code from:

```
C
C**********************************************************************
C        PERFORM CAVITY CALCULATIONS & PRINT RESULTS FOR TWO
C        ORIENTATIONS - HL ALONGWIND FIRST, THEN HW ALONGWIND.
C**********************************************************************
C
      IF (HB.GT.0. .AND. HW.GT.0. .AND. HL.GT.0.) THEN
         CALL CAVITY
      END IF
```

to:

```
C**********************************************************************
C        PERFORM CAVITY CALCULATIONS & PRINT RESULTS FOR TWO
C        ORIENTATIONS - HL ALONGWIND FIRST, THEN HW ALONGWIND.
C**********************************************************************
C
      IF (HB.GT.0. .AND. HW.GT.0. .AND. HL.GT.0.) THEN
        IF (ISS .EQ. 0) THEN
C          PREFORM THE REGULATORY CAVITY CALCULATIONS

            write(iout,*)
            write(iout,*) '****************************************'
            write(iout,*) '     *** REGULATORY (Default) ***  '
            write(iout,*) '    PERFORMING CAVITY CALCULATIONS '
            write(iout,*) '  WITH ORIGINAL SCREEN CAVITY MODEL'
            write(iout,*) '          (BRODE, 1988) '
            write(iout,*) '****************************************'
            write(iout,*)

            CALL CAVITY

c ---       Redefine summary output vaariables to be consistent with
c ---       CAVITY2
            cavchi(3)=cavchi(2)
            xr(3)=xr(2)
            cavchi(2)=cavchi(1)
            xr(2)=xr(1)
            cavchi(4)=cavchi(3)
            xr(4)=xr(3)

            write(iout,*)
            write(iout,*) '****************************************'
            write(iout,*) '      END OF CAVITY CALCULATIONS '
            write(iout,*) '****************************************'
            write(iout,*)

         ELSE IF (ISS .EQ. 1) THEN

            write(iout,*)
            write(iout,*) '****************************************'
            write(iout,*) '       ***  NON-REGULATORY ***     '
            write(iout,*) '    PERFORMING CAVITY CALCULATIONS '
            write(iout,*) '   WITH SCHULMAN-SCIRE (1993) MODEL'
            write(iout,*) '****************************************'
            write(iout,*)

            write(iprt,*) 'Print concentration for all modeled speeds',
     &                    ' in addition to maximum concentration? '
            read(ird,100) QUERY
            write(idat,100) QUERY
            if (QUERY .EQ. 'Y' .OR. QUERY .EQ. 'y') then
               lwind=.TRUE.
            else
               lwind=.FALSE.
            endif

            write(iprt,*)
            write(iprt,*) 'Enter stack location (divided ',
     &                    'by along-wind building scale, L).'
```

```
      write(iprt,*) 'Origin for this is the CENTER of building,',
     &              ' so (absolute) ',
     &              'value lies between 0.0 and 0.5 if the stack',
     &              ' is on the roof.'
      write(iprt,*) '(It is reset in the model to 0.5 if larger)'
      write(iprt,*)
      write(iprt,*) 'Case 1:  LONGER side ALONG flow'
      write(iprt,*)
      write(iprt,*) '         Example for (x/L = .4):'
      write(iprt,*)
      write(iprt,*) '             x/L'
      write(iprt,*) '           :-----------: '
      write(iprt,*) '      +--------------.---------------+ '
      write(iprt,*) '      |              .               | '
      write(iprt,*) '      |  S           .               | '
      write(iprt,*) '      |              .               | '
      write(iprt,*) '      |              .               | '
      write(iprt,*) '      +--------------.---------------+ '
      write(iprt,*) '     .5              0              .5 '
      write(iprt,*)
      write(iprt,*) '             <--- Wind --->           '
      write(iprt,*)
      write(iprt,*)
      write(iprt,*) 'ENTER x/L (LONGER side ALONG flow) = '
      read(ird,*) xstkw
      xstkw = ABS(xstkw)
      if(xstkw .GT. .5) then
         xstkw = .5
         lroof = .FALSE.
         write(iprt,*)
      endif
      write(idat,*) xstkw

      write(iprt,*)
      write(iprt,*)
      write(iprt,*)
      write(iprt,*) 'Case 2:  SHORTER side ALONG flow '
      write(iprt,*)
      write(iprt,*) '         Example for (x/L = .15)'
      write(iprt,*)
      write(iprt,*) '                    x/L  '
      write(iprt,*) '                    :-:          '
      write(iprt,*) '              +-------.-------+    '
      write(iprt,*) '              |       .       |    '
      write(iprt,*) '              |       . S     |    '
      write(iprt,*) '              |       .       |    '
      write(iprt,*) '              |       .       |    '
      write(iprt,*) '              |       .       |    '
      write(iprt,*) '              |       .       |    '
      write(iprt,*) '              |       .       |    '
      write(iprt,*) '              |       .       |    '
      write(iprt,*) '              +-------.-------+    '
      write(iprt,*) '             .5       0      .5    '
      write(iprt,*) '                                   '
      write(iprt,*) '              <--- Wind --->       '
      write(iprt,*)
      write(iprt,*) 'x/L (SHORTER side ALONG flow) = '
      read(ird,*) xstkl
      xstkl = ABS(xstkl)
      if(xstkl .GT. .5) then
         xstkl = .5
         lroof = .FALSE.
         write(iprt,*)
      endif
      write(idat,*) xstkl

c ---
      Report stack location
      if(.not. LROOF) then
         write(iprt,*)
         write(iprt,*) 'Stack was placed at location away from',
```

```
     &                        ' the building'
            write(iprt,*) 'Stack is REPOSITIONED to EDGE of',
     &                        ' the building'
          endif
          write(iprt,*) 'Stack x/L (LONGER side ALONG flow) = ',xstkw
          write(iprt,*) 'Stack x/L (SHORTER side ALONG flow)= ',xstkl
          write(iout,*) 'Stack x/L (LONGER side ALONG flow) = ',xstkw
          write(iout,*) 'Stack x/L (SHORTER side ALONG flow)= ',xstkl

c ---     Make sure that stack height (AGL) is .GE. building height IF
c ---     stack is on building
          if(LROOF .AND. hs .LT. hb) then
            write(iprt,*) 'FATAL:  Stack-top was placed INSIDE ',
     &                    'building:'
            write(iprt,*) 'Building Ht = ',hb
            write(iprt,*) 'Stack-top   = ',hs
            stop
          endif

c ---     Process SHORTER side ALONG flow first (2 wind directions)
          write(iout,*)
          write(iout,*)
          write(iout,*) '1)  SHORTER Side ALONG flow, STACK nearer ',
     &                  'UPWIND edge of building'
          xstack = (.5-xstkl)*HL
          call CAVITY2(iprt,iout,xstack,hs,vs,ds,ts,ta,q,
     &                 hb,hw,hl,lwind,
     &                 cavchi(1),xr(1))
c ---     Skip second wind direction if stack is at center of roof
          if(xstkl .NE. 0.0) then
            write(iout,*)
            write(iout,*)
            write(iout,*) '2)  SHORTER Side ALONG flow, STACK ',
     &                    'nearer DOWNWIND edge of building'
            xstack = HL-xstack
            call CAVITY2(iprt,iout,xstack,hs,vs,ds,ts,ta,q,
     &                   hb,hw,hl,lwind,
     &                   cavchi(2),xr(2))
          else
            cavchi(2)=cavchi(1)
            xr(2)=xr(1)
          endif

c ---     Process LONGER side ALONG flow (2 wind directions)
          write(iout,*)
          write(iout,*)
          write(iout,*) '3)  LONGER Side ALONG flow, STACK nearer ',
     &                  'UPWIND edge of building'
          xstack = (.5-xstkw)*HW
          call CAVITY2(iprt,iout,xstack,hs,vs,ds,ts,ta,q,
     &                 hb,hl,hw,lwind,
     &                 cavchi(3),xr(3))
c ---     Skip second wind direction if stack is at center of roof
          if(xstkw .NE. 0.0) then
            write(iout,*)
            write(iout,*)
            write(iout,*) '4)  LONGER Side ALONG flow, STACK nearer',
     &                    ' DOWNWIND edge of building'
            xstack = HW-xstack
            call CAVITY2(iprt,iout,xstack,hs,vs,ds,ts,ta,q,
     &                   hb,hl,hw,lwind,
     &                   cavchi(4),xr(4))
          else
            cavchi(4)=cavchi(3)
            xr(4)=xr(3)
          endif

          write(iout,*)
          write(iout,*) '****************************************'
          write(iout,*) '      END OF CAVITY CALCULATIONS '
          write(iout,*) '****************************************'
```

```
            write(iout,*)

          END IF
        END IF
```

10. Output format statements were modified to accommodate the new output information from the new option. The following code was changed from:

```
        WRITE(IOUT,910)
910     FORMAT(/2X,'CALCULATION',6X,'MAX CONC',3X,'DIST TO',2X,'TERRAIN',
     &     /,3X,'PROCEDURE',6X,'(UG/M**3)',3X,'MAX (M)',3X,'HT (M)',
     &     /,1X,'--------------  -----------  -------  -------')
        IF (CMAXST .GT. 0.0) THEN
```

to:

```
        WRITE(IOUT,910)
910     FORMAT(/2X,'CALCULATION',8X,'MAX CONC',4X,'DIST TO',3X,'TERRAIN',
     &     /,3X,'PROCEDURE',8X,'(UG/M**3)',4X,'MAX (M)',4X,'HT (M)',
     &     /,1X,'--------------    -----------   -------   -------')
        IF (CMAXST .GT. 0.0) THEN
```

and from:

```
           WRITE(IOUT,920) CMAXST,XMAXST,TMAXST
920        FORMAT(1X,'SIMPLE TERRAIN',3X,G10.4,2X,F7.0,4X,F5.0,/)
        END IF
```

to:

```
           WRITE(IOUT,920) CMAXST,XMAXST,TMAXST
920        FORMAT(1X,'SIMPLE TERRAIN',5X,G10.4,3X,F7.0,5X,F5.0,/)
        END IF
```

and from:

```
          WRITE(IOUT,930) CMAXCT,XMAXCT,TMAXCT
930       FORMAT(1X,'COMPLEX TERRAIN',2X,G10.4,2X,F7.0,4X,F5.0,
     &           ' (24-HR CONC)',/)
```

to:

```
          WRITE(IOUT,930) CMAXCT,XMAXCT,TMAXCT
930       FORMAT(1X,'COMPLEX TERRAIN',4X,G10.4,3X,F7.0,5X,F5.0,
     &           ' (24-HR CONC)',/)
```

11. The following format statements were added to accommodate the output from the new cavity algorithm:

```
        END IF
        IF (CAVCHI(1) .GT. 0.0 .OR. CAVCHI(2) .GT. 0.0) THEN
           WRITE(IPRT,940) (I,CAVCHI(I),XR(I),I=1,2)
           WRITE(IOUT,940) (I,CAVCHI(I),XR(I),I=1,2)
940        FORMAT(1X,'BLDG. CAVITY-',I1,3X,G10.4,2X,F7.0,6X,'--',
     &           '  (DIST = CAVITY LENGTH)')
           WRITE(IPRT,*) ' '
```

to:

```
        END IF
        IF (ISS .EQ. 0) THEN
          IF (CAVCHI(1) .GT. 0.0 .OR. CAVCHI(2) .GT. 0.0) THEN
             WRITE(IPRT,940) (I,CAVCHI(I),XR(I),I=1,1)
             WRITE(IPRT,940) (I,CAVCHI(3),XR(3),I=2,2)
             WRITE(IOUT,940) (I,CAVCHI(I),XR(I),I=1,1)
             WRITE(IOUT,940) (I,CAVCHI(3),XR(3),I=2,2)
940          FORMAT(1X,'BLDG. CAVITY-',I1,5X,G10.4,3X,F7.0,7X,'--',
     &             '  (DIST = CAVITY LENGTH)'/)
             WRITE(IPRT,*) ' '
             WRITE(IOUT,*) ' '
```

```
       END IF
      ELSE
       IF (CAVCHI(1) .GT. 0.0 .OR. CAVCHI(3) .GT. 0.0) THEN
        cavdef1='  (SHORTER side ALONG flow;'
        cavdef2='  stack nearer upwind face)'
        WRITE(IPRT,942) CAVCHI(1),XR(1),cavdef1
        WRITE(IPRT,941) cavdef2
        WRITE(IOUT,942) CAVCHI(1),XR(1),cavdef1
        WRITE(IOUT,941) cavdef2
        cavdef1='  (SHORTER side ALONG flow;'
        cavdef2='  stack nearer dnwind face)'
        WRITE(IPRT,942) CAVCHI(2),XR(2),cavdef1
        WRITE(IPRT,941) cavdef2
        WRITE(IOUT,942) CAVCHI(2),XR(2),cavdef1
        WRITE(IOUT,941) cavdef2
        cavdef1='  (LONGER  side ALONG flow;'
        cavdef2='  stack nearer upwind face)'
        WRITE(IPRT,942) CAVCHI(3),XR(3),cavdef1
        WRITE(IPRT,941) cavdef2
        WRITE(IOUT,942) CAVCHI(3),XR(3),cavdef1
        WRITE(IOUT,941) cavdef2
        cavdef1='  (LONGER  side ALONG flow;'
        cavdef2='  stack nearer dnwind face)'
        WRITE(IPRT,942) CAVCHI(4),XR(4),cavdef1
        WRITE(IPRT,941) cavdef2
        WRITE(IOUT,942) CAVCHI(4),XR(4),cavdef1
        WRITE(IOUT,941) cavdef2
942     FORMAT(1X,'BUILDING CAVITY ',3X,G10.4,3X,F7.0,7X,'--',a27)
941     FORMAT(47X,'--',a27)
        WRITE(IPRT,*) ' '
```

and from:

```
        WRITE(IOUT,*) ' '
      END IF
```

to:

```
        WRITE(IOUT,*) ' '
       END IF
      END IF
```

12. The following format statements were adjusted to accommodate the new option output:

```
        WRITE(IOUT,950) CMAXIF,XMAXIF
950     FORMAT(1X,'INV BREAKUP FUMI',1X,G10.4,2X,F7.0,6X,'--',/)
      END IF
```

to:

```
        WRITE(IOUT,950) CMAXIF,XMAXIF
950     FORMAT(1X,'INV BREAKUP FUMI',3X,G10.4,3X,F7.0,7X,'--',/)
      END IF
```

and from:

```
        WRITE(IOUT,960) CMAXSF,XMAXSF
960     FORMAT(1X,'SHORELINE FUMI',3X,G10.4,2X,F7.0,6X,'--')
      END IF
```

to:

```
        WRITE(IOUT,960) CMAXSF,XMAXSF
960     FORMAT(1X,'SHORELINE FUMI',5X,G10.4,3X,F7.0,7X,'--')
      END IF
```

and from:

```
        WRITE(IPRT,1000) OUTFIL
1000    FORMAT(' THE OUTPUT FILE, "',A12,'", HAS BEEN PRINTED.')
```

```
      ELSE IF (QUERY .EQ. 'N' .OR. QUERY .EQ. 'n') THEN
```

to:

```
         WRITE(IPRT,1000) OUTFIL
1000     FORMAT(' THE OUTPUT FILE, "',A12,'", HAS BEEN PRINTED.'/'1')
      ELSE IF (QUERY .EQ. 'N' .OR. QUERY .EQ. 'n') THEN
```

and from:

```
         WRITE(IDAT,100) QUERY
         WRITE(IPRT,1001) OUTFIL
1001     FORMAT(' THE RESULTS OF THIS RUN ARE IN FILE, "',A12,'".')
      ELSE
```

to:

```
         WRITE(IDAT,100) QUERY
         WRITE(IPRT,1001) OUTFIL
1001     FORMAT(' THE RESULTS OF THIS RUN ARE IN FILE, "',A12,'".'/'1')
      ELSE
```

13. The following form feed character, FFEED, variable typing was dropped from the INPUT- P, A, F, and V subroutines which changed the code from:

```
      INCLUDE 'MAIN.INC'
      CHARACTER*1 FFEED
      NPD = 0
```

to:

```
      INCLUDE 'MAIN.INC'
      NPD = 0
```

14. Input is read throught the character variable, OPTG. A line of code was added to delete leading and trailing blank spaces. The code was changed from:

```
  402 READ(IRD,9044) OPTG
 9044 FORMAT(A80)
```

to:

```
  402 READ(IRD,9044) OPTG
      ILEN = LEN_TRIM(OPTG)
 9044 FORMAT(A80)
```

15. The subroutine LWRUPR was altered to pass the variables, OPTG and ILEN, to LWRUPR from the main program. The call statement to LWRUPR was changed from:

```
      CALL LWRUPR
```

to:

```
      CALL LWRUPR(OPTG, ILEN)
```

16. In several of the subroutines, the form feed variable was deleted. The code in each subroutine was changed from:

```
C
C     Assign ASCII Form Feed Character to Variable FFEED
      FFEED = CHAR(12)
      WRITE(IOUT,101) FFEED
      WRITE(IOUT,102) RUNDAT, RUNTIM
101   FORMAT(1X,A1)
102   FORMAT(70X,A8/70X,A8)
```

to:

```
C
```

```
      WRITE(IOUT,102) RUNDAT, RUNTIM
102   FORMAT(70X,A8/70X,A8)
```

17. The following code was added after each one of the input echoing algorithms to print whether a regulatory or non-regulatory option was selected:

```
      IF (ICI .EQ. 1) THEN
         WRITE(IOUT, 105)
        ELSE
         WRITE(IOUT, 106)
      END IF
      IF (HANE .EQ. 10.0) THEN
         WRITE(IOUT, 107) HANE
        ELSE
         WRITE(IOUT, 108) HANE
      END IF
105   FORMAT(' THE NON-REGULATORY BUT CONSERVATIVE BRODE 2 MIXING'
     +       ' HEIGHT OPTION WAS SELECTED.')
106   FORMAT(' THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS',
     +       ' SELECTED.')
107   FORMAT(' THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF',F5.1,
     +       ' METERS WAS ENTERED.'/)
108   FORMAT(' A NON-REGULATORY ANEMOMETER HEIGHT (HANE) OF',F6.1,
     +       ' METERS WAS ENTERED.'/)
```

18. To accomodate the new format statements, the following format number was changed from 105 to 109:

```
      ELSE
         WRITE(IOUT,109) ANGLE
109      FORMAT('    ANGLE RELATIVE TO LONG AXIS = ',F12.4,/)
      END IF
```

19. The length of the option line input is determined and later passed to the Subroutine LWRUPR to convert lower case characters to upper case. The code was changed from:

```
  402 READ(IRD,9044) OPTG
 9044 FORMAT(A80)
```

to:

```
  402 READ(IRD,9044) OPTG
      ILEN = LEN_TRIM(OPTG)
 9044 FORMAT(A80)
```

20. The variables OPTG and ILEN are passed to Subroutine LWRUPR as arguments for processing. The CALL statement was changed from:

```
C     Convert Lower Case to Upper Case
      CALL LWRUPR
C
```

to:

```
C     Convert Lower Case to Upper Case
      CALL LWRUPR(OPTG, ILEN)
C
```

21. In the Subroutine LWRUPR, the code was revised to accept data through the use of arguments as opposed to passing the data throught COMMON statements. The code was changed from:

```
      SUBROUTINE LWRUPR
```

to:

```
      SUBROUTINE LWRUPR(OPTG, ILEN)
```

The INCLUDE statement in Subroutine LWRUPR was commented out:

```
C      INCLUDE 'MAIN.INC'
```

The variable OPTG was typed as follows:

```
      CHARACTER OPTG*80
```

22. Only the first ILEN characters are processed and the DO 20 statement was changed from:

```
      DO 20 I = 1, 80
```

to:

```
      DO 20 I = 1, ILEN
```

23. The definition of ZREF was added by changing the code from:

```
C                    3 - INPUT SINGLE STAB CLASS AND WIND SPEED
C
```

to:

```
C                    3 - INPUT SINGLE STAB CLASS AND WIND SPEED
C             ZREF  - ANEMOMETER HEIGHT (M)
C
```

24. Because of the variable anemometer height option added to the code, the following WRITE statements were changed from:

```
34       WRITE(IPRT,*) 'ENTER 10-METER WIND SPEED (M/S):'
         READ(IRD,*,ERR=34) UINP
```

to:

```
34       WRITE(IPRT,*) 'ENTER ANEMOMETER HEIGHT WIND SPEED (M/S):'
         READ(IRD,*,ERR=34) UINP
```

and from:

```
         WRITE(IOUT,130) UINP
130      FORMAT(1X,'*** 10-METER WIND SPEED OF ',F6.2,' M/S ONLY ***')
C
```

to:

```
         WRITE(IOUT,130) UINP
130      FORMAT(1X,'*** ANEMOMETER HEIGHT WIND SPEED OF ',F6.2,
     +             ' M/S ONLY ***')
C
```

and from:

```
       IF (LDEP) THEN
          WRITE(IPRT,317)
          WRITE(IOUT,317)
317       FORMAT(23X,'DEPOS AT ',28X,'CONC AT  ',/
```

to:

```
       IF (LDEP) THEN
          IF (HANE .EQ. 10) THEN
             WRITE(IPRT,317)
             WRITE(IOUT,317)
           ELSE
```

```
            WRITE(IPRT,318)
            WRITE(IOUT,318)
          END IF
         ELSE
          IF (AREA) THEN
           IF (HANE .EQ. 10) THEN
            WRITE(IPRT,319)
            WRITE(IOUT,319)
           ELSE
            WRITE(IPRT,320)
            WRITE(IOUT,320)
          END IF
         ELSE
          IF (HANE .EQ. 10.0) THEN
           WRITE(IPRT,300)
           WRITE(IOUT,300)
          ELSE
           WRITE(IPRT,301)
           WRITE(IOUT,301)
          END IF
         END IF
        END IF
300     FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
     &        3X,'PLUME',3X,'SIGMA',3X,'SIGMA',/,4X,'(M)',3X,
     &        '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &        'HT (M)',3X,'Y (M)',3X,'Z (M)',2X,'DWASH',/,1X,
     &        '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &        '-----',2X,'------',2X,'------',2X,'------',2X,
     &        '------',2X,'-----')
301     FORMAT(3X,'DIST',5X,'CONC',12X,'UHANE',3X,'USTK',2X,'MIX HT',
     &        3X,'PLUME',3X,'SIGMA',3X,'SIGMA',/,4X,'(M)',3X,
     &        '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &        'HT (M)',3X,'Y (M)',3X,'Z (M)',2X,'DWASH',/,1X,
     &        '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &        '-----',2X,'------',2X,'------',2X,'------',2X,
     &        '------',2X,'-----')
317       FORMAT(23X,'DEPOS AT ',28X,'CONC AT  ',/
```

and from:

```
     &                1X,'----',1X,'-----')
      ELSE IF (AREA) THEN
         WRITE(IPRT,319)
         WRITE(IOUT,319)
319      FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
```

to:

```
     &                1X,'----',1X,'-----')
318      FORMAT(23X,'DEPOS AT ',28X,'CONC AT  ',/
     &          3X,'DIST',4X,'MAX CONC',4X,'MAX CONC ',6X,'UHANE',
     &                   4X,'MAX DEPOS',4X,'MAX DEPOS',7X,'UHANE',/
     &    4X,'(M)',3X,'(UG/M**3)',2X,'(G/M**2-HR)',1X,'STAB',1X,'(M/S)',
     &           3X,'(G/M**2-HR)',2X,'(UG/M**3)',2X,'STAB',1X,'(M/S)',
     &          /,1X,'-------',2X,'----------',2X,'----------',1X,
     &               '----',1X,'-----',4X,'----------',2X,'----------',
     &               1X,'----',1X,'-----')
319      FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
```

and from:

```
     &          '-------')
      ELSE
         WRITE(IPRT,300)
         WRITE(IOUT,300)
300      FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
     &          3X,'PLUME',3X,'SIGMA',3X,'SIGMA',/,4X,'(M)',3X,
     &          '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &          'HT (M)',3X,'Y (M)',3X,'Z (M)',2X,'DWASH',/,1X,
     &          '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &          '-----',2X,'------',2X,'------',2X,'------',2X,
```

```
     &          '------',2X,'-----')
      END IF
C

to:

     &          '-------')
320      FORMAT(3X,'DIST',5X,'CONC',12X,'UHANE',3X,'USTK',2X,'MIX HT',
     &          3X,'PLUME',2X,'MAX DIR',/,4X,'(M)',3X,
     &          '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &          'HT (M)',3X,'(DEG)',/,1X,                 /
     &          '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &          '-----',2X,'------',2X,'------',2X,
     &          '-------')
C

and from:

      IF (LDEP) THEN
         WRITE(IPRT,317)
         WRITE(IOUT,317)
317      FORMAT(23X,'DEPOS AT ',28X,'CONC AT  ',/

to:

      IF (LDEP) THEN
         IF (HANE .EQ. 10) THEN
            WRITE(IPRT,317)
            WRITE(IOUT,317)
           ELSE
            WRITE(IPRT,318)
            WRITE(IOUT,318)
         END IF
        ELSE
         IF (AREA) THEN
          IF (HANE .EQ. 10) THEN
             WRITE(IPRT,319)
             WRITE(IOUT,319)
            ELSE
             WRITE(IPRT,320)
             WRITE(IOUT,320)
          END IF
        ELSE
         IF (HANE .EQ. 10.0) THEN
            WRITE(IPRT,300)
            WRITE(IOUT,300)
          ELSE
            WRITE(IPRT,301)
            WRITE(IOUT,301)
         END IF
        END IF
       END IF
300    FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
     &        3X,'PLUME',3X,'SIGMA',3X,'SIGMA',/,4X,'(M)',3X,
     &        '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &        'HT (M)',3X,'Y (M)',3X,'Z (M)',2X,'DWASH',/,1X,
     &        '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &        '-----',2X,'------',2X,'------',2X,'------',2X,
     &        '------',2X,'-----')
301    FORMAT(3X,'DIST',5X,'CONC',12X,'UHANE',3X,'USTK',2X,'MIX HT',
     &        3X,'PLUME',3X,'SIGMA',3X,'SIGMA',/,4X,'(M)',3X,
     &        '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &        'HT (M)',3X,'Y (M)',3X,'Z (M)',2X,'DWASH',/,1X,
     &        '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &        '-----',2X,'------',2X,'------',2X,'------',2X,
     &        '------',2X,'-----')
317       FORMAT(23X,'DEPOS AT ',28X,'CONC AT  ',/

and from:

     &               1X,'----',1X,'-----')
```

```
      ELSE IF (AREA) THEN
         WRITE(IPRT,319)
         WRITE(IOUT,319)
319      FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
```

to:

```
     &               1X,'----',1X,'-----')
318      FORMAT(23X,'DEPOS AT ',28X,'CONC AT  ',/
     &          3X,'DIST',4X,'MAX CONC',4X,'MAX CONC ',6X,'UHANE',
     &                4X,'MAX DEPOS',4X,'MAX DEPOS',7X,'UHANE',/
     &    4X,'(M)',3X,'(UG/M**3)',2X,'(G/M**2-HR)',1X,'STAB',1X,'(M/S)',
     &             3X,'(G/M**2-HR)',2X,'(UG/M**3)',2X,'STAB',1X,'(M/S)',
     &           /,1X,'-------',2X,'----------',2X,'----------',1X,
     &                '----',1X,'-----',4X,'----------',2X,'----------',
     &                1X,'----',1X,'-----')
319      FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
```

and from:

```
     &          '-------')
      ELSE
         WRITE(IPRT,300)
         WRITE(IOUT,300)
300      FORMAT(3X,'DIST',5X,'CONC',13X,'U10M',3X,'USTK',2X,'MIX HT',
     &          3X,'PLUME',3X,'SIGMA',3X,'SIGMA',/,4X,'(M)',3X,
     &          '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &          'HT (M)',3X,'Y (M)',3X,'Z (M)',2X,'DWASH',/,1X,
     &          '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &          '-----',2X,'------',2X,'------',2X,'------',2X,
     &          '------',2X,'-----')
      END IF
      N = 0
```

to:

```
     &          '-------')
320       FORMAT(3X,'DIST',5X,'CONC',12X,'UHANE',3X,'USTK',2X,'MIX HT',
     &          3X,'PLUME',2X,'MAX DIR',/,4X,'(M)',3X,
     &          '(UG/M**3)',3X,'STAB',2X,'(M/S)',2X,'(M/S)',4X,'(M)',3X,
     &          'HT (M)',3X,'(DEG)',/,1X,
     &          '-------',2X,'----------',2X,'----',2X,'-----',2X,
     &          '-----',2X,'------',2X,'------',2X,
     &          '-------')

      N = 0
```

25. To implement the Brode 2 mixing height option, the variable arrays, ZIMIN and ZIFACT, were dimensioned in MAIN.INC as part of the METVAR common statement and the associated data were initialized in a BLOCK statement. In the BLOCK statement, the code was changed from:

```
      DATA IRD/5/, IPRT/6/, IOUT/9/, IDAT/7/, IDBG/13/
```

to:

```
      DATA IRD/5/, IPRT/6/, IOUT/9/, IDAT/7/, IDBG/13/
      DATA ZIMIN /300.0, 100.0, 30.0, 30.0/
      DATA ZIFACT /0.01, 0.02, 0.03, 0.04/
```

26. The anemometer reference height, ZREF, was moved to another part of the program. The code was changed in three subroutines from:

```
C           ADJUST WIND SPEED FROM REFERENCE (ANEMOMETER) HEIGHT, ZREF,
C           OF 10-METERS, TO STACK HEIGHT
C
            ZREF = 10.0
            IF (RURAL) THEN
```

to:

```
C           ADJUST WIND SPEED FROM REFERENCE (ANEMOMETER) HEIGHT, ZREF,
C           TO STACK HEIGHT
C
            IF (RURAL) THEN
```

27. The following code was modified to add the Brode 2 Mixing Height option. The code was changed in three places from:

```
            IF (ZI .LT. HE+1.)  ZI = HE + 1.
C
C        MIXING HTS ARE NOT USED IN COMPUTING CONCENTRATIONS
C        DURING STABLE CONDITIONS.  SET TO 10000 M FOR E AND F.
```

to:

```
            IF (ZI .LT. HE+1.)  ZI = HE + 1.
C  FROM R. BRODE 1991 AMS CONFERENCE PREPRINT.  ADJUSTS MIXING HEIGHTS SO
C   CALCULATED CONCENTRATIONS ARE MORE CONSERVATIVE WITH RESPECT TO ISCST2
C   RESULTS.
         U10 = UREF * (10.0/HANE)**P
           IF (KST .LE. 4 .AND. ICI .EQ. 1) THEN
             ZI = MAX(ZIMIN(KST), (HE *(1.0 + ZIFACT(KST) * U10)))
           END IF

C
C        MIXING HTS ARE NOT USED IN COMPUTING CONCENTRATIONS
C        DURING STABLE CONDITIONS.  SET TO 10000 M FOR E AND F.
```

28. The model Julian date was changed from:

```
      DATA VERSN/'95250'/
```

to:

```
      DATA VERSN/'96043'/
```

Note: The Subroutines CAVITY2, PRISE, FRGAUSS and Function ERF were appended to the SCREEN3A.FOR source code and comprise the main parts of the option cavity algorithm.

The following pertains to changes made to the SCREEN3B.FOR source code:

29. The following code was changed to accommodate a variable anemometer height in the formula determining the critical wind speed value at anemometer height, the value 10. was changed to ZREF. The code was changed from:

```
         UC10M(I) = UC * (10./AMAX1(10.,HS))**0.20
```

to:

```
         UC10M(I) = UC * (ZREF/AMAX1(10,HS))**0.20
```

30. The following WRITE statements were re structured to accommodate output wind speeds at other than 10 meters. The code was changed from:

```
      WRITE(IPRT,610) (UC10M(I),I=1,2)
      WRITE(IOUT,610) (UC10M(I),I=1,2)
610   FORMAT(3X,2('CRIT WS @10M (M/S) = ',F8.2,8X))
      WRITE(IPRT,620) (UCSTK(I),I=1,2)
```

to:

```
      IF (ABS(HANE-10.0) .LT. .1) THEN
         WRITE(IPRT,610) (UC10M(I),I=1,2)
         WRITE(IOUT,610) (UC10M(I),I=1,2)
       ELSE
```

```
         WRITE(IPRT,612) (UC10M(I),I=1,2)
         WRITE(IOUT,612) (UC10M(I),I=1,2)
      END IF
610   FORMAT(3X,2('CRIT WS @10M (M/S) = ',F8.2,8X))
612   FORMAT(3X,2('CRIT WS @HANE(M/S) = ',F8.2,8X))
      WRITE(IPRT,620) (UCSTK(I),I=1,2)
```

31. The following definition was commented in by changing the code from:

```
C           X2HB  - 2*BUILDING HT (M)
C
```

to:

```
C           X2HB  - 2*BUILDING HT (M)
C           ZREF  - ANEMOMETER HEIGHT
C
```

32. The following comments were reworded from:

```
C
C        BEGIN BY SETTING THE INITIAL 10M WIND SPEED TO 1 M/S AND THE
C        NEXT WIND SPEED AT 20 M/S. THESE TWO WIND SPEEDS SHOULD
C        SERVE AS A BOUND FOR THE CRITICAL WIND SPEED.  IF NOT THE
C        ROUTINE RETURNS TO CAVITY.
C
```

to:

```
C
C        BEGIN BY SETTING THE INITIAL WIND SPEED AT ANEMOMETER HEIGHT
C        TO 1 M/S AND THE NEXT WIND SPEED AT 20 M/S. THESE TWO WIND
C        SPEEDS SHOULD SERVE AS A BOUND FOR THE CRITICAL WIND SPEED.
C        IF NOT THE ROUTINE RETURNS TO CAVITY.
C
```

33. The fixed anemometer height of 10. meters was replaced by a variable anemometer height variable, ZREF. The code was changed from:

```
      U1TEN = 20.
      U0 = U0TEN*(AMAX1(10.,HS)/10.)**0.20
      U1 = U1TEN*(AMAX1(10.,HS)/10.)**0.20
      UMIN = U0
```

to:

```
      U1TEN = 20.
      U0 = U0TEN*(AMAX1(10,HS)/ZREF)**0.20
      U1 = U1TEN*(AMAX1(10,HS)/ZREF)**0.20
      UMIN = U0
```

34. The following code in the VALLEY subroutine was changed in several places to add code to print whether the data was processed using regulatory or non-regulatory option(s). The code was changed from:

```
     &          1X,'   URBAN/RURAL OPTION     = ',7X,A5,/)

      ELSE IF (FLARE) THEN
         WRITE(IOUT,220) VERSN, TITLE, Q, HSTK, H, ZR, KPRT, HS
220      FORMAT(' ',1X,'***  SCREEN3 MODEL RUN  ***',
     &            /,2X,'*** VERSION DATED ',A5,' ***',//,1X,A79,//,
     &          1X,'COMPLEX TERRAIN INPUTS:',/,
     &          1X,'   SOURCE TYPE             =        FLARE',/,
     &          1X,'   EMISSION RATE (G/S)     = ',G16.6,/,
     &          1X,'   FLARE STACK HEIGHT (M) = ',F12.4,/,
     &          1X,'   TOT HEAT RLS (CAL/S)    = ',G16.6,/,
     &          1X,'   RECEPTOR HEIGHT (M)     = ',F12.4,/,
     &          1X,'   URBAN/RURAL OPTION     = ',7X,A5,/,
```

```
     &          1X,'   EFF RELEASE HEIGHT (M) = ',F12.4,/)

      ELSE
         RETURN
      END IF
```

to:

```
     &          1X,'   URBAN/RURAL OPTION      = ',7X,A5,/)
      IF (ICI .EQ. 1) THEN
         WRITE(IOUT, 105)
        ELSE
         WRITE(IOUT, 106)
      END IF
      IF (HANE .EQ. 10.0) THEN
         WRITE(IOUT, 107) HANE
        ELSE
         WRITE(IOUT, 108) HANE
      END IF
```

and from:

```
      IF (VS .LT. 1.0E-05) VS = 1.0E-05
```

to:

```
105   FORMAT(' THE NON-REGULATORY BUT CONSERVATIVE BRODE 2 MIXING'
     +       ' HEIGHT OPTION WAS SELECTED.')
106   FORMAT(' THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS',
     +       ' SELECTED.')
107   FORMAT(' THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF',F5.1,
     +       ' METERS WAS ENTERED.'/)
108   FORMAT(' A NON-REGULATORY ANEMOMETER HEIGHT (HANE) OF',F6.1,
     +       ' METERS WAS ENTERED.'/)


      ELSE IF (FLARE) THEN
         WRITE(IOUT,220) VERSN, TITLE, Q, HSTK, H, ZR, KPRT, HS
220      FORMAT(' ',1X,'***  SCREEN3 MODEL RUN  ***',
     &             /,2X,'*** VERSION DATED ',A5,' ***',//,1X,A79,//,
     &           1X,'COMPLEX TERRAIN INPUTS:',/,
     &           1X,'   SOURCE TYPE             =        FLARE',/,
     &           1X,'   EMISSION RATE (G/S)     = ',G16.6,/,
     &           1X,'   FLARE STACK HEIGHT (M) = ',F12.4,/,
     &           1X,'   TOT HEAT RLS (CAL/S)    = ',G16.6,/,
     &           1X,'   RECEPTOR HEIGHT (M)     = ',F12.4,/,
     &           1X,'   URBAN/RURAL OPTION      = ',7X,A5,/,
     &           1X,'   EFF RELEASE HEIGHT (M) = ',F12.4,/)
      IF (ICI .EQ. 1) THEN
         WRITE(IOUT, 105)
        ELSE
         WRITE(IOUT, 106)
      END IF
      IF (HANE .EQ. 10.0) THEN
         WRITE(IOUT, 107) HANE
        ELSE
         WRITE(IOUT, 108) HANE
      END IF


      ELSE
         RETURN
      END IF

      IF (VS .LT. 1.0E-05) VS = 1.0E-05
```

and from:

```
         END IF
         IF (N .EQ. 1) THEN
```

```
            WRITE(IPRT,300)
            WRITE(IOUT,300)
          END IF
          IF (N .EQ. 6 .OR. N .EQ. 11 .OR. N .EQ. 16) WRITE(IPRT,300)
          WRITE(IPRT,310) HTER,X,CHICNT,CHIVAL,HEC,CHISIM,HES,KSTS,
     &                    UREFOUT,USOUT
          WRITE(IOUT,310) HTER,X,CHICNT,CHIVAL,HEC,CHISIM,HES,KSTS,
     &                    UREFOUT,USOUT
300       FORMAT(26X,'*VALLEY 24-HR CALCS*',3X,'**SIMPLE TERRAIN 24-HR',
```

to:

```
          END IF
          IF (N .EQ. 1) THEN
            IF (HANE .EQ. 10.0) THEN
               WRITE(IPRT,300)
               WRITE(IOUT,300)
             ELSE
               WRITE(IPRT,301)
               WRITE(IOUT,301)
            END IF
          END IF
          IF (N .EQ. 6 .OR. N .EQ. 11 .OR. N .EQ. 16) THEN
            IF (HANE .EQ. 10.0) THEN
               WRITE(IPRT,300)
             ELSE
               WRITE(IPRT,301)
            END IF
          END IF
300       FORMAT(26X,'*VALLEY 24-HR CALCS*',3X,'**SIMPLE TERRAIN 24-HR',
```

and from:

```
     &       1X,'----')
310       FORMAT(1X,F5.0,1X,F7.0,1X,2(G10.4,2X),F6.1,3X,G10.4,2X,F6.1,3X,
```

to:

```
     &       1X,'----')
301       FORMAT(26X,'*VALLEY 24-HR CALCS*',3X,'**SIMPLE TERRAIN 24-HR',
     &       ' CALCS**',/,1X,' TERR',9X,'MAX 24-HR',14X,
     &       'PLUME HT',13X,'PLUME HT',/,3X,'HT',4X,'DIST',2X,
     &       '  CONC',8X,'CONC',4X,'ABOVE STK',4X,'CONC',4X,'ABOVE STK'
     &       ,3X,'UHANE',1X,'USTK',/,2X,'(M)',4X,'(M)',3X,'(UG/M**3)',3X,
     &       '(UG/M**3)',2X,'BASE (M)',2X,'(UG/M**3)',2X,'HGT (M)',
     &       2X,'SC',3X,'(M/S)',/,1X,'-----',1X,'-------',1X,
     &       '----------',2X,'----------',2X,'------',3X,
     &       '----------',2X,'------',2X,'--',1X,'----',
     &       1X,'----')

          WRITE(IPRT,310) HTER,X,CHICNT,CHIVAL,HEC,CHISIM,HES,KSTS,
     &                    UREFOUT,USOUT
          WRITE(IOUT,310) HTER,X,CHICNT,CHIVAL,HEC,CHISIM,HES,KSTS,
     &                    UREFOUT,USOUT
310       FORMAT(1X,F5.0,1X,F7.0,1X,2(G10.4,2X),F6.1,3X,G10.4,2X,F6.1,3X,
```

Any questions should be directed to the SCRAM BBS Sysop via the TTN.

Model Change Bulletin

MCB #7

TSCREEN (dated 95260)

This Model Change Bulletin documents the revisions to the TSCREEN model (dated 95260). TSCREEN, a model for screening toxic air pollutant concentrations, is based on the release scenarios and methods described in "Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants," EPA-454/R-92-024. In order to continue providing improved modeling techniques, the new TSCREEN model (dated 95260) contains several changes from the workbook that are described below. These changes will be incorporated into the workbook at a later date.

The changes to the TSCREEN model include the following:

1. The SCREEN2 model used in the previous version of TSCREEN has been replaced with the current version of the SCREEN3 model (dated 95250) available from the SCRAM BBS. This version of the SCREEN3 model is consistent with the ISCST3 model (dated 95250).

2. For scenarios that utilize the area source option of the SCREEN3 model, the new area source algorithm is now based on a double integration of the Gaussian plume kernel for area sources instead of the finite line segment algorithm as used in the previous version. Area source distances continue to be measured from the center of the area source. The capability of making concentration estimates within the area source is now possible. The option to use a revised (draft) version of the SCREEN2 model (dated 94133) that incorporates a numerical integration algorithm for modeling area sources is thus not necessary any longer and is removed.

Due to these revisions in the model, ambient air impacts for those scenarios that utilize the area source algorithm are different than those obtained from the previous version of TSCREEN, or shown in the current version of the workbook.

The TSCREEN model has been zipped into 4 files for convenient downloading. These are TSCREEN1.ZIP; TSCREEN2.ZIP; TSCREEN3.ZIP; and TSCREEN4.ZIP. These contain the executable files that are necessary to run the model. Users of the previous version of the TSCREEN model (dated 94133) need only download the files TSCREEN3.ZIP and TSCREEN4.ZIP, since the information in files TSCREEN1.ZIP and TSCREEN2.ZIP has not changed. Some users may want the model source code as well, and this file is called TSCRCODE.ZIP.

After you download the 4 zipped files, copy them on a subdirectory, unzip them using the PKUNZIP utility program, and then type TSCREEN. The program pop-up menus will appear, and you are on your way.

If you should have questions or comments about the TSCREEN model, contact Joe Touma at (919) 541-5381.

TSCREEN OUTPUTS

06/17/99

10:23:44

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 95250 ***

McAlister Landfill (normalized emission rate of 1 g/s) TSCREEN

COMPLEX TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HT (M)	=	1.0000
STACK DIAMETER (M)	=	.0760
STACK VELOCITY (M/S)	=	.0000
STACK GAS TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)	
COMPLEX TERRAIN	23.81	500.	18.	(24-HR CONC)

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

FINAL STABLE PLUME HEIGHT (M) = .8
DISTANCE TO FINAL RISE (M) = 151.3

			VALLEY 24-HR CALCS		**SIMPLE TERRAIN 24-HR CALCS**				
TERR HT (M)	DIST (M)	MAX 24-HR CONC (UG/M**3)	CONC (UG/M**3)	PLUME HT ABOVE STK BASE (M)	CONC (UG/M**3)	PLUME HT ABOVE STK HGT (M)	SC	U10M (M/S)	USTK (M/S)
6.	200.	12.55	12.55	.8	.0000	.0	0	.0	.0
18.	500.	23.81	23.81	.8	.0000	.0	0	.0	.0
40.	1000.	11.26	11.26	.8	.0000	.0	0	.0	.0
40.	1500.	6.442	6.442	.8	.0000	.0	0	.0	.0
40.	2000.	4.222	4.222	.8	.0000	.0	0	.0	.0

****
*** END OF SCREEN MODEL OUTPUT ***
****

06/17/99

10:28:02

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 95250 ***

McAlister Lanfill (normalized emission rate of 1 g/s) TSCREEN

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	1.0000
STK INSIDE DIAM (M)	=	.0760
STK EXIT VELOCITY (M/S)	=	.0000
STK GAS EXIT TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	.2231E+06	25.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
25.	.2231E+06	6	1.0	1.0	10000.0	.77	1.12	.75	NO
100.	.3183E+05	6	1.0	1.0	10000.0	.77	4.07	2.33	NO
200.	9886.	6	1.0	1.0	10000.0	.77	7.73	4.09	NO
300.	4991.	6	1.0	1.0	10000.0	.77	11.23	5.62	NO
400.	3067.	6	1.0	1.0	10000.0	.77	14.64	7.05	NO
500.	2101.	6	1.0	1.0	10000.0	.77	17.97	8.40	NO
600.	1543.	6	1.0	1.0	10000.0	.77	21.24	9.69	NO
700.	1188.	6	1.0	1.0	10000.0	.77	24.46	10.93	NO
800.	959.8	6	1.0	1.0	10000.0	.77	27.63	11.98	NO
900.	795.3	6	1.0	1.0	10000.0	.77	30.78	12.98	NO
1000.	672.2	6	1.0	1.0	10000.0	.77	33.88	13.95	NO
1100.	580.3	6	1.0	1.0	10000.0	.77	36.96	14.82	NO
1200.	507.4	6	1.0	1.0	10000.0	.77	40.01	15.66	NO
1300.	448.5	6	1.0	1.0	10000.0	.77	43.04	16.47	NO

1400.	400.1	6	1.0	1.0	10000.0	.77	46.05	17.26	NO
1500.	359.7	6	1.0	1.0	10000.0	.77	49.03	18.03	NO
1600.	325.7	6	1.0	1.0	10000.0	.77	51.99	18.78	NO
1700.	296.7	6	1.0	1.0	10000.0	.77	54.94	19.52	NO
1800.	271.7	6	1.0	1.0	10000.0	.77	57.87	20.23	NO
1900.	250.0	6	1.0	1.0	10000.0	.77	60.78	20.94	NO
2000.	231.0	6	1.0	1.0	10000.0	.77	63.68	21.63	NO
2100.	215.2	6	1.0	1.0	10000.0	.77	66.56	22.21	NO
2200.	201.2	6	1.0	1.0	10000.0	.77	69.42	22.78	NO
2300.	188.6	6	1.0	1.0	10000.0	.77	72.28	23.34	NO
2400.	177.3	6	1.0	1.0	10000.0	.77	75.12	23.89	NO
2500.	167.1	6	1.0	1.0	10000.0	.77	77.95	24.42	NO
2600.	157.9	6	1.0	1.0	10000.0	.77	80.76	24.95	NO
2700.	149.5	6	1.0	1.0	10000.0	.77	83.57	25.47	NO
2800.	141.8	6	1.0	1.0	10000.0	.77	86.36	25.98	NO
2900.	134.8	6	1.0	1.0	10000.0	.77	89.15	26.48	NO
3000.	128.3	6	1.0	1.0	10000.0	.77	91.92	26.98	NO
3500.	103.9	6	1.0	1.0	10000.0	.77	105.65	28.98	NO
4000.	86.59	6	1.0	1.0	10000.0	.77	119.17	30.84	NO
4500.	73.73	6	1.0	1.0	10000.0	.77	132.50	32.57	NO
5000.	63.86	6	1.0	1.0	10000.0	.77	145.67	34.21	NO
5500.	56.08	6	1.0	1.0	10000.0	.77	158.69	35.76	NO
6000.	49.82	6	1.0	1.0	10000.0	.77	171.58	37.23	NO
6500.	44.67	6	1.0	1.0	10000.0	.77	184.34	38.64	NO
7000.	40.39	6	1.0	1.0	10000.0	.77	196.99	40.00	NO
7500.	36.90	6	1.0	1.0	10000.0	.77	209.54	41.16	NO
8000.	33.91	6	1.0	1.0	10000.0	.77	221.98	42.28	NO
8500.	31.32	6	1.0	1.0	10000.0	.77	234.34	43.36	NO
9000.	29.07	6	1.0	1.0	10000.0	.77	246.61	44.40	NO
9500.	27.08	6	1.0	1.0	10000.0	.77	258.79	45.41	NO
10000.	25.33	6	1.0	1.0	10000.0	.77	270.90	46.38	NO
15000.	14.93	6	1.0	1.0	10000.0	.77	388.43	54.88	NO
20000.	10.54	6	1.0	1.0	10000.0	.77	500.95	60.29	NO
25000.	8.049	6	1.0	1.0	10000.0	.77	609.75	64.86	NO
30000.	6.462	6	1.0	1.0	10000.0	.77	715.59	68.84	NO
40000.	4.643	6	1.0	1.0	10000.0	.77	920.22	74.49	NO
50000.	3.597	6	1.0	1.0	10000.0	.77	1117.42	79.19	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 25. M:

25.	.2231E+06	6	1.0	1.0	10000.0	.77	1.12	.75	NO

DIST = DISTANCE FROM THE SOURCE
CONC = MAXIMUM GROUND LEVEL CONCENTRATION
STAB = ATMOSPHERIC STABILITY CLASS (1=A, 2=B, 3=C, 4=D, 5=E, 6=F)
U10M = WIND SPEED AT THE 10-M LEVEL
USTK = WIND SPEED AT STACK HEIGHT
MIX HT = MIXING HEIGHT
PLUME HT= PLUME CENTERLINE HEIGHT
SIGMA Y = LATERAL DISPERSION PARAMETER
SIGMA Z = VERTICAL DISPERSION PARAMETER
DWASH = BUILDING DOWNWASH:
DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

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*** END OF SCREEN MODEL OUTPUT ***
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